GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16171

Transmission and Engine Oil Cooler Hose

1 Scope

1.1 Material Description. Materials covered by this specification are divided into two (2) sets of constructions and categories. The "Construction" of hose defines both the material content and construction of the hose. The "Category" of the hose defines the fluid with which it has been qualified for service. The hose is therefore defined as GMW16171 Type XYZ, where "X" refers to the construction of the hose, and the "YZ" refers to the category to which the hose has been qualified for service. Thus, the material "Type" is defined by a combination of its Construction and Category. It is possible for a hose to be approved to more than one (1) Type.

1.1.1 Construction: The "Construction" of hose defines the material content and construction of the hose. All hoses shall have a reinforcement of textile braid. Hoses shall be black. The hoses and/or hose assemblies are capable of giving satisfactory service in an automobile from temperatures of -40 °C to the continuous and excursion temperatures shown for the respective construction. The descriptions of the constructions of hose used for this application are identified in 1.1.1.1 through 1.1.1.5.

1.1.1.1 Construction A. This hose consists of a smooth bore tube of chlorinated polyethylene (CM) compound, resistant to Dexron® VI (9986153, GMW16955 Fluid L) and/or engine oil (93165203, GMW16955 Fluid F), dependent on the Category of the hose, which is reinforced with aramid braid, and has a cover of CM compound. The hose and/or hose assembly is capable of giving satisfactory service at temperatures of -40 °C to +140 °C with intermittent operation at temperatures up to +162 °C maximum.

1.1.1.2 Construction B. This hose consists of a smooth bore tube of chlorinated polyethylene (CM), ethylene acrylate (AEM) or polyacrylate (ACM) compound, resistant to Dexron® VI (9986153) and/or engine oil (93165203), dependent on the Category of the hose, which is reinforced with aramid braid, and has a cover of AEM or ACM compound. The hose and/or hose assembly is capable of giving satisfactory service at temperatures of -40 °C to +150 °C with intermittent operation at temperatures up to +162 °C maximum.

1.1.1.3 Construction C. This hose consists of a smooth bore tube of ACM or AEM compound, resistant to Dexron® VI (9986153), and/or engine oil (93165203), dependent on the Category of the hose, reinforced with aramid braid, and a cover of ACM or AEM. The hose and/or hose assembly is capable of giving satisfactory service to temperatures of -40 °C to +160 °C with intermittent operation at temperatures up to +175 °C maximum.

1.1.1.4 Construction D. This hose consists of a smooth bore tube of Fluorocarbon Rubber, Fluoroelastomer Material (FKM) compound, resistant to Dexron® VI (9986153), and/or engine oil (93165203), dependent on the Category of the hose, reinforced with aramid braid, and a cover of FKM. The hose and/or hose assembly is capable of giving satisfactory service to temperatures of -40 °C to +200 °C with intermittent operation at temperatures up to +225 °C maximum.

1.1.1.5 Construction E. This hose consists of a smooth bore tube of FKM compound, resistant to Dexron® VI (9986153), and/or engine oil (93165203), dependent on the Category of the hose, and an outer reinforcement layer with aramid braid. The hose and/or hose assembly is capable of giving satisfactory service to temperatures of -40 °C to +200 °C with intermittent operation at temperatures up to +225 °C maximum.

Note: Fluorocarbon Rubber, Fluoroelastomer Material (FKM) may have limitations in flexibility at cold temperatures. Applications using Construction D or Construction E hose that involve motion and flexing of this hose may require additional validation testing to confirm adequate flexibility at cold temperatures for these applications.

1.1.2 Categories. The "Category" of hose defines the fluid with which it has been qualified for service. The descriptions of the categories of the fluids used in these hoses are identified in 1.1.2.1 thru 1.1.2.4.

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1.1.2.1 Category 1A. Automatic Transmission Fluid (ATF). Test with 9986153 (Dexron® VI transmission fluid), qualification with GMW16955 Fluid L. Test fluid qualifies the hose for use with AF40-AW1 (9274975) and Dexron® III.

1.1.2.2 Category 1B. Automatic Transmission Fluid per Blueprint Requirements. Qualification tests are per blueprint requirements for the specific transmission oil part number.

1.1.2.3 Category 2A. Engine Oil. Test with engine oil (93165203). Qualification with GMW16955 Fluid F test fluid qualifies the hose for use with other released GM engine oils.

1.1.2.4 Category 2B. Engine Oil per Blueprint Requirements. Qualification tests are per blueprint requirements for the specific engine oil part number.

1.2 Symbols. Not applicable.

1.3 Applicability. This specification covers hoses for use with either automatic transmission fluid or engine oil.

1.4 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D412	ASTM D865	ISO 37	ISO 1817
ASTM D413	ASTM D1329	ISO 188	
ASTM D471	ISO 36	ISO 1431-1	

2.2 GM Standards/Specifications.

GMW3059	GMW14270	GMW16304	GMW16955

2.3 Additional References.

- 93165203 Engine oil part number.
- 9274975 Transmission oil part number.
- 9986153 Dexron Transmission fluid part number.
- Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02.

3 Requirements

3.1 Requirements on Test Specimens.

3.1.1 Test Samples. Unless otherwise specified, the shape and size of test pieces shall be in accordance with the relevant test method. Minimum six (6) test samples (hoses) are required for initial sample testing. Minimum three (3) test samples (hoses) are required for inspection testing.

3.1.1.1 Samples are finished parts or to be taken from finished parts. Where the dimensions on the finished parts do not allow preparing of test pieces, tests are to be performed on sheet material of same production batch. The same state of cure between slabs or buttons and finished parts must be assured by appropriate tests, which must be described in the test report.

If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion are to be tested at +23 °C ± 5 °C and with the same test methods. Unless otherwise stated, ambient temperature test conditions shall be held to +23 °C ± 5 °C. Unless otherwise stated, all other temperatures except +23 °C ± 5 °C shall be held to ± 3 °C.

3.1.2 Conditioning. Conditioning shall be as specified in the relevant test procedures.

3.1.3 Equipment. Conforming to the relevant test procedures.

3.1.4 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.5 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this specification shall be determined correctly with respect to its physical definition.

3.1.6 Facilities. Conforming to the relevant test procedures.

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3.1.7 Deviations. Deviations from the requirements of this specification shall have been agreed upon. Such deviations shall be specified on component drawings, test certificates, reports, etc.

3.2 Material and Performance Requirements.

3.2.1 Design Validation Testing. Material properties (material/compound approval) are summarized in Table 1. Performance Requirements (construction approval) are summarized in Table 2. For full approval of a hose compliance to the requirements of Table 1 and Table 2 is needed.

3.2.2 Product Validation Testing. If not defined otherwise, the following testing should be done for production audit testing.

- All tests per Table 1.
- Table 2 Tests: Hot Oil Burst, Hot Oil Recirculation and Accelerated Pressure Impulse Test.

3.2.3 Audit/Inspection Testing. If not defined otherwise, the following testing should be done for production audit testing.

- All tests per Table 1, except Cold Flexibility, Ozone, and Immersion in Fluid Tests.
- Table 2 Tests: Hot Oil Burst.

Table 1: Material Properties for the Tube and Cover Materials

Property	Test Method	Unit	Value
Elongation at Break, As-Received			
Construction A Construction B Construction C	ASTM D412 or ISO 37, Type 2 or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	%	150 Minimum
Construction D Construction E	ASTM D412 or ISO 37, Type 2 or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	%	250 Minimum
Tensile Strength, As-Received			
All Constructions	ASTM D412 or ISO 37, Type 2 or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	MPa	10 Minimum
Age Resistance (Heat Aging), Tube and Cover Materials			
Construction A	ASTM D865 or ISO 188 Method B, 168 h +0 h/-2 h at 150 °C ± 3 °C Change of elongation at break Change of tensile strength	 % %	 -60 Maximum -30 Maximum
Construction B	ASTM D865 or ISO 188 Method B, 168 h +0 h/-2 h at 150 °C ± 3 °C. Change of elongation at break Change of tensile strength	 % %	 -30 Maximum -20 Maximum
Construction C	ASTM D865 or ISO 188 Method B, 168 h +0 h/-2 h at 175 °C ± 3 °C. Change of elongation at break Change of tensile strength	 % %	 -60 Maximum -20 Maximum
Construction D	ASTM D865 or ISO 188 Method B, 504 h +0 h/-2 h at +200 °C ± 3 °C. Change of elongation at break Change of tensile strength	 % %	 -50 Maximum -20 Maximum
Construction E	ASTM D865 or ISO 188 Method B, 1008 h +0 h/-2 h at +200 °C ± 3 °C. Change of elongation at break Change of tensile strength	 % %	 -50 Maximum -20 Maximum
Construction D Construction E	ASTM D865 or ISO 188 Method B, 72 h +0 h/-2 h at 225 °C ± 3 °C. Change of elongation at break Change of tensile strength	 % %	 -50 Maximum -20 Maximum

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